

REMARKS

Claims 12-25 were presented for examination. In response to the outstanding office action claims 12, 17 and 18 were amended. Applicant respectfully requests entry of the amendments.

1. Rejection of claims 12-25 under 35 U.S.C. §112, first paragraph.

Claims 12-25 were rejected under 35 U.S.C. §112. Applicant respectfully traverses the rejection of claims 12-25 under 35 U.S.C. §112. More specifically, the limitation of “wherein a direction of heat transfer of the thermoelectric layer is parallel to a surface area of the thermoelectric layer, the surface area being greater than a width of the thermoelectric layer” is clearly supported by the application as filed. For example, at least Figures 6B, 7B illustrate a plurality of thermoelectric devices (62, 72) defining a surface area having a length or being greater than a width or height of the thermoelectric layer. Nevertheless, claims 12 and 18 have been amended thereby rendering the rejection under 35 U.S.C. §112 as being moot. Applicant respectfully reserves the right to file subsequent divisional or continuation applications containing the aforementioned claim limitations.

2. Rejection of claims 12-13, 15-20, and 23-25 under 35 U.S.C. §103(a) as being unpatentable over Enjoji et al., U.S. 2004/0101728, hereafter “Enjoji” or “728” in view of Cargnelli et al., U.S. 5,753,383, hereafter “Cargnelli” or “383.”

Claims 12-13, 15-20, and 23-25 stand rejected as obvious over the combination of Enjoji in view of Cargnelli.

The outstanding office action acknowledges that Enjoji fails to teach adjusting a voltage of a power source in response to measured temperatures to heat or cool the temperature of a portion of the fuel cell assembly in contact with the thermoelectric layer as required by Applicant’s amended independent claims 12 and 18. In the outstanding office action, Cargnelli is used to rectify the deficiencies of Enjoji. In particular, the outstanding office action states:

The Cargnelli reference teaches electrically connecting thermoelectric elements that are Peltier modules to the fuel cell stack so that the fuel cells' current can be applied to the Peltier modules to create a temperature gradient or differential across the element and reversing the direction of the current fed [sic] from the fuel cells to the thermoelectric element to heat or cool the surfaces of the fuel cell (See column 4, lines 47-55). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Enjoji method of controlling the temperature of the fuel cell stack to include the step of adjusting the voltage of the power source in response to the measured temperatures to heat or cool the temperature at the one or more locations of the fuel cell stack wherein the thermoelectric devices are Peltier devices in order to simplify the fuel cell system by using a device that can both heat and cool the fuel cell without an external cooling system.

(Office Action of 10/10/06, page 4-5).

Applicant greatly appreciates the detailed basis of rejection but must respectfully disagree.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP 2143.

The cited combination of Enjoji and Cargnelli fail to satisfy this standard for three reasons. First, the cited combination fails to teach or disclose one or more thermoelectric layers adjacent to at least a portion of one or more fuel cell assemblies. Second, the cited combination fails to teach or disclose utilizing one or more thermoelectric layers to control the temperature of one or more fuel cell assemblies in contact with the thermoelectric layer. Third, the cited combination fails to provide a motivation to do what Applicant has done. As a result, it is respectfully submitted that the cited combination fails to provide a prima facie case of obviousness with respect to the invention of amended independent claims 12 and 18 and all claims dependent thereon.

For example, Applicant must respectfully submit that the cited combination fails to disclose one or more thermoelectric layers adjacent to at least a portion of one or more fuel cell assemblies.

Enjoji is silent as to disposing thermoelectric layers adjacent to fuel assemblies. Indeed, Enjoji fails to disclose anything regarding thermoelectric layers. Rather, the teachings of Enjoji are limited to teaching how to warm up and control the temperature of a fuel cell stack using electric heaters. Nothing in the specification of Enjoji suggests utilizing thermoelectric layers to control the temperature of a fuel cell stack or placing them adjacent to fuel assemblies.

In contrast, Applicant requires one or more thermoelectric layers being disposed adjacent to one or more fuel assemblies in order to facilitate temperature control of fuel cells to maintain uniform temperature across a fuel stack.

Second, Enjoji fails to teach or disclose utilizing one or more thermoelectric layers to control the temperature of one or more fuel cell assemblies in contact with the thermoelectric layer.

Enjoji is directed to a method for warming up a fuel cell stack “in which the fuel cell stack can be warmed up reliably in a short period of time with a simple process, and operation of the fuel cells tack can be started rapidly.” (‘728, paragraph [0010]). To achieve this goal, Enjoji provides that the outermost fuel cell in a fuel stack is warmed up by a heating mechanism using external electrical energy. (‘728, paragraph [0059]). The outermost fuel cell is warmed up by the heating mechanism until it reaches a power generation temperature at which point the outermost fuel cell begins power generation to warm up the adjacent fuel cell. (‘728, paragraph [0059]). The fuel cells of the fuel stack are warmed up successively by power generation. (‘728, paragraph [0060]). Once warmed up, and as acknowledged in the outstanding office action, Enjoji provides for controlling the temperature of the fuel cell stack by using electric heaters disposed within the fuel cell assembly, wherein electrical energy generated in the fuel cell is selectively supplied to the electric heaters; and a radiator (heat sink) in thermal contact with a periphery of the fuel cell stack (Office Action of 10-10-06, pages 3-4). Nothing in the specification of Enjoji suggests the use of one or more thermoelectric layers in contact with a least a portion of at least one fuel cell assembly to control the

temperature of the fuel assembly and/or fuel stack. Moreover, Enjoji fails to teach adjusting the voltage of a power source in response to the measured temperatures of the fuel assembly or at one or more locations across the fuel stack.

In contrast the claims, as amended, require adjusting the voltage of a power source in response to the measured temperatures to heat or cool the temperature of a portion of the fuel cell assembly in contact with the thermoelectric layer in order to facilitate temperature control of fuel cells to maintain a uniform temperature across a fuel stack.

Cargnelli fails to rectify the deficiencies of Enjoji. Indeed, combination or modification of Enjoji with Cargnelli also fails to teach or suggest all the limitation of Applicant's amended independent claims 12 and 18. Cargnelli similarly fails to teach or suggest the use of one or more thermoelectric layers adjacent to and in contact with at least a portion of at least one fuel cell assembly to control the temperature of a fuel cell stack.

Cargnelli teaches a hybrid self-contained heating and electrical power supply process, which is particularly suited for sub-zero temperature environments. ('383, col. 1, lines 1-12). To achieve this goal, Cargnelli discloses a heating and power supply process that incorporates a hydrogen fuel cell, a thermoelectric generator and a catalytic burner. ('383, col. 1, lines 1-5). In particular, Cargnelli provides:

The burner module is juxtaposed to the fuel cell stack and the thermoelectric module to provide the primary source of heat for the system, to pre-heat a fuel and an oxidant for the fuel cell stack, and to generate a temperature differential across the thermoelectric module.

('383, col. 3, lines 56-65, figures 1 and 2).

The overall implication of Cargnelli, therefore, is that the catalytic burner module is adjacent to both the thermoelectric generator and the fuel stack. Nothing in the specification of Cargnelli suggests placing the thermoelectric generator adjacent to the fuel stack. Moreover, modifying the configuration of the Cargnelli invention would make it less suitable for operation in sub-zero temperature environments. Placing the burner module adjacent to both the thermoelectric generator and the fuel stack allows the

burner module's heat producing characteristics to keep the thermoelectric generator operating in cold climates ('383, col. 3, lines 20-21) and warm the fuelstack ('383, col. 6, lines 1-2). If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 123 U.S.P.Q. 349 (CCPA 1959); MPEP 2143.01.

In contrast, the claims, as amended, require one or more thermoelectric layers being disposed adjacent to one or more fuel assemblies in order to facilitate temperature control of fuel cells to maintain uniform temperature across a fuel stack.

Cargnelli fails to teach or suggest this claim limitation and, therefore, Applicant's invention cannot be said to be obvious over Cargnelli. Even if the teachings of a primary reference could be modified to arrive at the claimed subject matter, the modification is not obvious unless the prior art also suggests the *desirability* of such a modification. *In re Laskowski*, 10 U.S.P.Q.2d 1397, 1398 (Fed Cir. 1989).

Second, Cargnelli fails to teach or disclose utilizing one or more thermoelectric layers to control the temperature of one or more fuel cell assemblies in contact with the thermoelectric layer. Indeed, Cargnelli teaches away from utilizing a thermoelectric generator and teaches toward utilizing a catalytic burner to facilitate temperature control of the hybrid system which includes a fuel cell stack. As discussed above the Cargnelli provides for a heating and power supply process that incorporates a hydrogen fuel cell, a thermoelectric generator and a catalytic burner. ('383, col. 1, lines 1-5). The burner module is the primary source of heat for the system and is regulated to maintain the system's operating temperature. ('383, col. 3, lines 59-65). The thermoelectric generator is merely utilized to generate a secondary source of electricity to back up the fuel cell stack, which is the primary source of electricity and secondary source of heat. ('383, col. 3, lines 54-59). While Cargnelli provides that "the thermoelectric element is *electrically connected* to the fuel cell stack, so that the fuel cells' current can be applied to the Peltier modules to create a temperature gradient across the element...[to] provide *some degree of heating or cooling of surfaces*," ('383, col. 4, lines 48-54) (emphasis added) there is nothing in the specification of Cargnelli suggesting that the thermoelectric element is in contact with a fuel cell assembly. In fact, as mentioned

above, Carnelli teaches that the thermoelectric element and the fuel cell stack are not even adjacent to each other. Moreover, nothing in the specification of Carnelli suggests that the voltage of the fuel cell stack is adjusted in response to measured temperatures to heat or cool the temperature of fuel assemblies in contact with a thermoelectric layer at the one or more locations in the fuel cell stack. Furthermore, it is noted that modifying the configuration or primary roles of the three modules would interfere with operation of the Carnelli invention in sub-zero temperature environments as it is the degree of mutual redundancy to one another that allows “the self-contained system to operate in the cold and to achieve levels of reliability, fuel economy and operability unachievable...without significant complexity and capital cost increases.” (‘383, col. 3, lines 48-53).

Accordingly, the cited combination of Enjoji and Carnelli fails to (1) provide all the required claim limitations, i.e. (i) one or more thermoelectric layers adjacent to at least a portion of one or more fuel cell assemblies; and (ii) utilizing one or more thermoelectric layers to control the temperature of one or more fuel cell assemblies in contact with the thermoelectric layer, and (2) provide a motivation to dispose one or more thermoelectric layers adjacent to at least a portion of one or more fuel cell assemblies and to utilize one or more thermoelectric layers to control the temperature of one or more fuel cell assemblies in contact with the thermoelectric layers.

Applicant therefore respectfully submits that the cited combination of Enjoji and Carnelli fail to provide a prima facie case of obviousness as required by MPEP 2143.

Reconsideration and removal of the obviousness rejection with respect to amended independent claims 12 and 18 is respectfully requested. Dependent claims 13, 15-17, 20, and 23-25 are likewise submitted to be nonobvious as these claims incorporate all of the limitations of amended independent claims 12 and 18.

3. **Rejection of claims 14 and 22 under 35 U.S.C. §103(a) as being unpatentable over Enjoji et al., U.S. 2004/0101728, hereafter “Enjoji” or “728” in view of Carnelli et al., U.S. 5,753,383, hereafter “Carnelli” or “383” and in further view of Doke, U.S. 5,576,512, hereafter “Doke” or “512.”**

Claims 14 and 22 stand rejected as obvious over the combination of Enjoji in view of Cargnelli and in further view of Doke.

The outstanding office action acknowledges that Enjoji and Cargnelli both fail to expressly teach a power source that is a battery. Doke is relied upon to rectify the deficiencies of Enjoji and Cargnelli. In particular, the office action states:

The Doke reference teaches thermoelectric systems where the power source is a battery (See column 2, lines 30-35). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Enjoji/Cargnelli method of controlling the temperature of the fuel cell stack to include a power source that is a battery in order to be able to heat the fuel cells during start-up without using electrical energy generated by the fuel cells.

(Office Action of 10/10/06, page 5)

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks for section 2 are incorporated herein by reference. As noted therein, the cited combination of Enjoji and Cargnelli fails to (1) provide all the required claim limitations, i.e. (i) one or more thermoelectric layers adjacent to at least a portion of one or more fuel cell assemblies; and (ii) utilize one or more thermoelectric layers to control the temperature of one or more fuel cell assemblies in contact with the thermoelectric layer, and (2) provide a motivation to dispose one or more thermoelectric layers adjacent to at least a portion of one or more fuel cell assemblies and to utilize one or more thermoelectric layers to control the temperature of one or more fuel cell assemblies in contact with the thermoelectric layers. Nothing in Doke rectifies these deficiencies as to amended independent claims 12 and 18 or any claims dependent thereon.

Because dependent claims 14 and 22 incorporate all of the limitations of amended independent claims 12 and 18, they are likewise nonobvious over the cited combination of Enjoji, Cargnelli, and Doke.

Reconsideration and removal of the rejection is respectfully requested.

4. Rejection of claim 21 under 35 U.S.C. §103(a) as being unpatentable over Enjoji et al., U.S. 2004/0101728, hereafter “Enjoji” or “728” in view of Cargnelli et al., U.S. 5,753,383, hereafter “Cargnelli” or “383” and in further view of Walsh, U.S. 2003/0044662, hereafter “Walsh” or “662.”

Claim 21 stands rejected as obvious over the combination of Enjoji in view of Cargnelli and in further view of Walsh.

The outstanding office action acknowledges that Enjoji and Cargnelli both fail to expressly teach temperature devices that are thermocouples. Walsh is relied upon to rectify the deficiencies of Enjoji and Cargnelli. In particular, the outstanding office action states:

The Walsh reference does teach a thermocouple coupled to a control circuit for regulating the temperature of the fuel cell (See paragraph [0026]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Enjoji/Cargnelli method of controlling the temperature of the fuel cell stack to include thermocouples associated with each thermoelectric device so that temperature of the fuel cell can be more reliably measured.

(Office Action of 10/10/06, pages 5-6)

Applicants greatly appreciate the detailed basis of rejection but must respectfully disagree.

The foregoing remarks for section 2 are incorporated herein by reference. As noted therein, the cited combination of Enjoji and Cargnelli fails to (1) provide all the required claim limitations, i.e. (i) one or more thermoelectric layers adjacent to at least a portion of one or more fuel cell assemblies; and (ii) utilize one or more thermoelectric layers to control the temperature of one or more fuel cell assemblies in contact with the thermoelectric layer, and (2) provide a motivation to dispose one or more thermoelectric layers adjacent to at least a portion of one or more fuel cell assemblies and to utilize one or more thermoelectric layers to control the temperature of one or more fuel cell assemblies in contact with the thermoelectric layers. Nothing in Walsh rectifies these deficiencies as to amended independent claim 18 or any claims dependent thereon.

Because dependent claim 21 incorporates all of the limitations of amended independent claim 18, it is likewise nonobvious over the cited combination of Enjoji, Cargnelli, and Walsh.

Reconsideration and removal of the rejection is respectfully requested.

CONCLUSION

In view of the above amendments and the discussion relating thereto, it is respectfully submitted that the present application is in condition for allowance. Such action is most earnestly solicited. If for any reason the Examiner feels that consultation with Applicants' attorney would be helpful in the advancement of the prosecution, the Examiner is invited to call the telephone number below for an interview.

If there are any charges due with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130, maintained by the applicant's attorney.

Respectfully submitted,

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